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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/018,727

**Applicant(s)**

WILLIS ET AL.

**Examiner**

MARIANNE L. PADGETT

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 12 and 21-27 is/are pending in the application.
- 4a) Of the above claim(s) 22-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 12, 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)  
Paper No(s)/Mail Date \_\_\_\_\_

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

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1. A **Request for Continued Examination** under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/30/2008 has been entered.

It is noted that the amendment independent claim 1, so that the process is directed specifically to the use of glycidyl methacrylate, find support in the cited example 1 on page 11, as well as page 5, lines 1-8 & original claims 2-4, where  $n = 1$ ,  $R^3 = \text{methyl}$  &  $R^4 = R^5 = H$ , although no average power density is recited in the example, the disclosure on page 6, lines 10-12 provides the claimed range as the most preferred for the disclosed pulsed plasma discharge processes. The examiner additionally noted that new claims 22-27 also found support on page 8, line 16-page 9, line 4, however that the submitted support in the original claims referred to claims nonelected without traverse at the outset of examination (see below).

2. Newly submitted **claims 22-27** are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: these claims are directed to subject matter **previously restricted in the requirement of 8/18/2004 & nonelected in the response of 9/20/2004 without traverse**, as there are directed to the nonelected subject matter (special technical feature as per PCT rules) of adhering 2 substrates together (group III, original claims 13-19, e.g. laminating, not previously examined), which the examiner notes is subject matter of class 156, thus has a different classification than claims previously examined directed to coating processes (class 427).

The examiner notes that as rewritten, under US restriction practice it might be considered that these new claims are directed to a different species than was previously examined, i.e. the plasma pretreatment process for the purpose of coating with a solution (i.e. claim 12, with independent claim 1 being generic) was previously pursued, with new claims 22-27 directed to a generic laminating process (also/still a different technical feature), with new claims 26-27 directed to a subspecies of laminating that

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excludes the presence of a solution coating, adhering the plasma treated surface directly to nucleophilic groups on an opposing surface. It is further noted that while claims 22-25 also directed to laminating, encompass the possibility of a solution coating in that the deposited coupling agent of claims 23 & 25 could be but is not necessarily a solution, thus encompasses the possibility of a solution coating, so may be considered a different technical feature of laminating or adhering to substrates together, as opposed to the previously pursued/examined coating process, that was consistent with elected group I (examined), as well as groups II & IV.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, **claims 22-27 withdrawn** from consideration as being directed to a **non-elected species** of the invention. See 37 CFR 1.142(b) and MPEP § 821.03.

3. **Claims 12 & 21** are rejected under 35 U.S.C. **112, second** paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In **claim 12**, in the last line "the epoxy groups" has no proper antecedent basis, as the polymer grown on the substrate surface did not previously use language identifier groups, but stated "polymer growth of a reactive epoxy containing coating" (claim 1, line 8). The examiner notes that an effective way to clarify this issue would be by inserting -- having epoxy groups -- after "coating" on line 8.

4. Note in the new claims which correspond to a laminating process, but although they do not require, some could possibly encompass initial coating of the plasma treated surface with a solution that was the coupling agent (claims 23 & 25) were to be considered, the following clarity issues would require consideration: Use relative terms in the claims without clear metes and bounds therein, or in a clear definition provided by the specification or cited relevant prior art, is vague and indefinite. In new **claim 22**, line 3, see "reactive groups", which is a newly introduced term, having no clear or necessary

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connection to the limitations of the independent claim, since no groups (reactive or nonreactive) were introduced in the independent claim & reactive group does not necessarily refer to "reactive epoxy containing" used as a modifier to describe the plasma deposited polymer coating. Note that claim 24 defines what the reactive groups are, so as to sufficiently define the relative term, thus is not included in this rejection.

Note that new claim 23 has the additional problem of requiring further undefined "reactive groups" to be present on the "other surface", such that it is unclear whether the same reactive groups are present on both the plasma treated & "the other surface" or if the reactive groups there are some different unspecified "reactive groups", which are further relative as one cannot determine from the claim exactly how or with what they are reacting with in the coupling agent.

5. The following is a quotation of 35 U.S.C. **103(a)** which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. **Claims 1, 12 & 21** are rejected under 35 U.S.C. **103(a)** as being unpatentable over **Connell et al** (UK 1,037,144), in view of **Timmons et al** (5,876,753) or visa versa, previously discussed

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in sections 9-10, 5, 3, 3 & 4 of the actions mailed 1/12/2005, 9/28/2005, 3/21/2006, 8/28/2006 & 5/17/2007, respectively.

Applicants' independent claim has been amended to specifically require glycidyl methacrylate (GMA), instead of the broader polymerizable epoxy monomer of the previously claimed formula II of which GMA was a specific species, however the obviousness of using this particular species was previously considered & discussed as set forth below. Independent claim I has also been further amended so as to broaden its scope with respect to the pulsed plasma deposition conditions, such that average power density of  $\leq 0.0025 \text{ W/cm}^3$  is the only pulsed plasma deposition condition required.

As previously discussed, in **Connell et al**, see Fig. 1, p. 2, lines 26-53 & 87-128+ for plasma apparatus and parameters used in the plasma polymerization process, and see p. 2, lines 66-72 for a variety of monomers that includes epoxies, such as **glycidyl methacrylate** (line 70), which according to the PCT examination & applicants' specification (page 5, lines 6-8), which gives this compound as an example of applicants' formula III) reads on the monomer used in these claims. From the structure of glycidyl acrylate (p. 569 of Hawley's Cond. Chem. Dictionary, 12<sup>th</sup> ed), it is clear that the analogous methacrylate compound corresponds to applicant's formula (II), where  $R_1 = \text{CH}_3\text{C}=\text{CH}_2$ ;  $n = 1$ , for the  $\text{CH}_2$  group, thus confirming the PCT evaluation.

While Connell et al teach plasma polymerization of claimed monomers, they do not discuss use of pulsed plasma and parameters associated therewith, or reactive potential of resultant epoxy functionalized coated surface with a nucleophile, such as an amine or carboxylic acid as independent claims 12 & 21.

**Timmons et al** teach plasma polymerization of monomers using continuous or pulsed plasma, where use of low energy plasma, as exemplified by a pulsed plasma of 200 W (over what volume not given) and on-off duty cycles of 3/5, 3/15, 3/45 and 3/60 ms, using allyl bromide to illustrate important principles of Timmons et al's process ((col. 6, lines 26-45)i.e. these conditions can not and should not be

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considered limiting to all the possible types of monomers that they suggest as useful). However, the present claims no longer require ON/OFF times (i.e. such as 2/1000 & 1/1000 as possible maximums & minimums). It is noted that average powers for exemplary duty cycles would be approximately 75 W, 33 W, 12.5 W & 0.0 95 W, respectively, but are for total power input, not power density, thus cannot be directly compared to the claimed parameter range. In Timmons et al., is further taught to **use of such low energies to enable the deposited polymer to retain active functional groups that can be employed in a derivatization reaction to covalently couple to these groups**, which are taught to **include various O-containing fictionalization, including epoxy (table on col. 9)**. The derivatization is said to be a variety of nucleophilic displacement, which may use various amino containing materials that are a subset of the claimed amines. See the abstract; col. 3, lines 45-col. 4, line 38, esp. col. 3, lines 50-55 & 62-col. 4, lines 5, 24 & 30-38; col. 6, lines 15-col. 7, line 45+; col. 8, line 1-6; col. 9, lines 1-32. It would have been further obvious to one of ordinary skill in the art when employing the pulsed plasma process to determine desirable ranges of pulsed plasma parameters for the polymerization reaction via routine experimentation to provide an effectively low power plasma as taught by Timmons et al to enable retention of active functional groups, especially given their teaching on col. 7-8, that **different reaction chambers provide additional variables for determining parameters**, and employing taught power, on/off relationships as a guide to power (& corresponding power density) and cycle time determination. It is noted that besides not actually disclosing the any explicit duty cycle ranges (only a specific ON time & a range OFF times), **applicants' specification** does not provide any particular significance to either the specific examples or general ranges of ON/OFF time from which some possible duty cycles may be calculated, nor to the duty cycle in general, **considering determination of "pulsing arrangements" to be "routine" (page 6, lines 17-18)**, hence no unexpected or critical results was seen to be taught in association with these on/off times or duty cycle values, especially considering the general concept is covered by Timmons et al.

While Timmons et al include epoxy-containing monomers in their teachings, exemplified by allyl glycidylether; they do not disclosure compounds of applicants' particularly claimed epoxy formulas.

Also the particular energy density range (or on-off time) parameters are not explicitly taught.

It would have been obvious to one of ordinary skill in the art to employ the pulsed plasma process in the deposition of Connell et al or the monomer, glycidyl methacrylate, in the process of Timmons et al, because in the first case, Timmons teaches the equivalent usage of continuous or pulsed for plasma deposition (abstract), but further provides advantages in energy control due to use of pulsed plasma, that enables generally enables retention of reactive functional groups & further use of the deposits for the claimed process of immobilizing a nucleophilic reagent without further modification, thus suggesting the desirability of pulsed plasmas & motivating their use instead of continuous plasmas. Use of Connell et al's monomer in Timmons et al's process, would have been obvious, as it is consistent with the generic categories of useful compounds taught, capable of providing desired functional groups for the subsequent derivatization/immobilization reaction, and has been shown to be effectively deposited via plasma polymerization, which is the process employed by Timmons et al, thus providing motivation to employ this particular monomer source GMA for epoxy functional groups.

It would have been further obvious to one ordinary skill to determine desirable ranges of pulsed plasma parameters for the polymerization reaction for specific monomers via **routine experimentation** to provide an effective low power plasma as taught by Timmons et al, especially given their teaching on col. 7-8, that different reaction chambers provide additional variables for determining parameters, and employing taught power, on/off relationships as a guide to power usage (hence power density) and cycle time determination. Note while Timmons et al provides some exemplary powers, they do not give power density, which can not be specifically determined or explicitly compared, if plasma volume is not known, but energy density is related to the above routine experimentation to determine parameters, hence would have been expected to be considered by one of ordinary skill and competence in the art.



Independent claim 1 presently requires "an average power density of the pulsed plasma discharge is less than  $0.0025 \text{ W/cm}^3$ ", which had previously been narrowed from less than  $0.05 \text{ W/cm}^3$ , & remains germane to the routine experimentation arguments. Hence, it remains considered that while the applied references do not provide values of power density *per se*, Timmons et al. was previously noted to provide **teachings on routine experimentation to provide an effective low power plasma** in col. 7-8.

Particularly see therein lines 28-45 in col. 7, which discuss how the volume of the reactor chamber affects power density in plasmas of like power, stating "large reaction volume at a given applied power would also **provide increase retention of monomer functional groups**, as this variation in effect decreases the power density during plasma polymerization processes" (emphasis added), thus from the teachings of Timmons et al., it is considered that it would have remained clear to one of ordinary skill in the art to employ routine experimentation to adjust one's power density for the particular reagents employed, so as to provide desired retention of monomer functional groups as taught, which from the teachings of Timmons to effect low-power plasmas, that take into consideration volume, would have been expected to include optimization to relatively low powers, such as those within power densities claimed. The narrower claimed power density range was not considered to provide a significant differentiation from teachings of routine experimentation for essentially optimization purposes, especially as one of ordinary skill would realize that optimization values would vary depending on the particular functional group desired to be retained, with the general knowledge that epoxies are generally very reactive (i.e. easily reacted), so would have been expected to require lower energies than less reactive functional groups, & further considering that **applicants' specification** provides no determinable actual evidence or data for the superiority of the presently claimed average power density range, with or without combination with ON/OFF times over any other average power density range or cycle times used in another pulsed plasma, that can be **necessarily** derived from the specification as originally filed.

Applicants have previously alleged (bottom p.7, 12/30/2005 remarks) that Timmons et al. teach away from "low pulsed plasma discharge", however this "low" had no clear meaning & their following discussion concerning pulsed low duty cycles was & remains irrelevant to most the claims, as the unsupported duty cycle ranges were deleted from the claims, plus as currently amended the claims no longer even require any limitations to the timing of the pulses. Applicants' previous discussion (top p.8, 12/30/2005 remarks) of depositions using "pulses of extremely low mean power (0.04 W)" with reference to examples 4 & 5 on page 9, was noted to be inconsistent with the **applicant's specification's** examples, as none of the examples on p. 9 -10, i.e. examples 1-9, have any teachings of "mean power", as they all provide only a "peak power = 40W", which even given the ON and OFF times of the plasma, does not provide sufficient information to calculate an arithmetic mean power, as **peak power** is the **highest value** reached, providing no other information on what percentage of the ON time is at peak power or instantaneous power values during the ON period, nor would such a value have any relevant meaning with respect to the present claim limitations, which relate to power density, thus require one to know the plasma volume. The examiner noted that  $< 0.05 \text{ W/cc}$  & the preferred range of  $< 0.0025 \text{ W/cc}$  was introduced on page 6, lines 10-12, where the "average power of the pulsed plasma discharge" would in context more properly read --average power density...--, however the context of the specification would imply that this is the average power over the duration of the pulses only, because that's when the discharge is taking place, but discussion concerning duty cycle, which is only relevant to claim 7, suggest averaging over both the pulses ON-time and OFF-time. As the examiner noted no teachings of plasma volume for the particular taught ranges of  $(20 \mu\text{s ON})/(10,000\text{-} 20,000 \mu\text{s OFF})$ , she sees no way to relate the claimed plasma power density values to the exemplary 40 W peak power used with the exemplary ON/OFF times  $(20 \mu\text{s}/20 \text{ ms})$ , hence the examples are not commensurate in scope with the claim limitations. As was previously quarried, is it possible that a declaration/affidavit could be presented that provided more complete information on the examples in the specification, such that a clear relationship

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could be determined between the claimed power density & the information of the specific examples?

Note, it would still be necessary for the claims to be commensurate in scope with any evidence said to show a patently significant difference.

With respect to specification teachings relating to criticality of the pulsed plasma parameter of power density (i.e.  $< (0.05 \text{ or } 0.0025) \text{ W/cc}$ ), the only place it was found to be mentioned was on page 6, lines 10-12, where it was never particularly related specifically to any of the individual compounds, nor more than generally to the on-off times (i.e. duty cycle). None of the examples disclose what power densities were used to produce their results, only providing teachings comparing continuous wave plasma and pulsed plasma, where the pulsed plasma used specific parameters of a peak power of 40 W, with 20  $\mu\text{s}$  ON time/20 ms OFF time, which as discussed above provides no determinable significance to the power density in the independent claim 1. While the compositional data on the deposits comparing continuous plasma and pulsed pulsed, show significant differences therebetween, those differences are consistent with the teachings of Timmons et al., who notes that as compared to continuous plasmas, pulsed plasmas are expected to increase retention of functional groups, such that one would have expected that an increased percentage of heteroatoms a functional groups, such as oxygen, to remain. Thus applicant's experimental data is consistent with the expectations provided by the teachings of Timmons et al. for pulsed plasma versus continuous plasma, especially **lacking a showing** that this particular range of **power densities** has a **significantly** different or unexpected effect in the deposition of GMA, as compared to higher power densities also for pulsed plasmas (i.e. not just the expected trends & affects suggested by the teachings of Timmons et al.), or that GMA as compared to other epoxy monomers is significantly differently affected (examples 1 & 4 of the specification hint at that for GMA & AGE, but are not commensurate in scope with the claims (see above concerning parameters)), the examiner finds no patentable significance in this particular narrower range for the claims as written, as it appears to be

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consistent with routine experimentation to optimize pulsed plasma parameters, and expected taught trends associated with pulsed low-power plasmas.

7. As stated in section 6 of the 9/28/2005 action, it remains noted that FR 2,581,991 to Delfort et al cited by PCT, continues to provide cumulative evidence that the amine groups provided to the active epoxy functional groups on the coated surface, would have been expected to proceed in a covalent coupling reaction or derivatization at the site of the epoxy as suggested and claimed, as well as providing further evidence of the known desirability of such reaction products.

8. **Claims 1, 12 & 21** are rejected under 35 U.S.C. **103(a)** as being unpatentable over **Timmons et al** ((753), discussed above in section 6), in view of **Kolluri et al** (5,723,219), previously discussed in sections (10 & 12-13), (3 & 5), 5 & 6 of the actions mailed 1/12/05, 3/21/2006, 8/28/2006 & 5/17/2007, respectively, and reiterated below.

As noted above Timmons et al teach allyl glycidyl ether (AGE) as an **exemplary epoxy**-containing monomer, instead of the claimed epoxy compound of GMA, but **Kolluri et al** also teach analogous plasma polymerization reactions, where either **AGE or GMA** are taught to be **deposited for their reactive epoxy functional groups**, hence use of GMA in Timmons et al would have been expected to be effective for the taught process due to taught equivalent usage, providing an alternative species for the generically taught epoxy containing monomers. Above discussions of routine experimentation are equally applicable in this combination, as previously noted.

In Kolluri et al., specifically see the abstract; col. 2, lines 35-57+ for prior art plasma polymerization and its limits; col. 3, lines 5-26 for background discussion of **pulsed plasma polymerization to preserve functional groups** in deposited films; summary for sequential plasma depositions; col. 5, lines 40-49 for classes of monomer including **epoxies**, with lines 47-48 teaches allyl glycidyl ether, glycidyl methacrylate (GMA), etc; col. 6, lines 5-30 teaching various amines & lines 60-67 plasma in general to plasma deposit monomeric compounds as sources of named functional groups; col.

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7, table I gives surface functional groups where the functional group remaining on the surface for 1<sup>st</sup> plasma deposited layer is in the first column of table I, and what it reacts with in the 2nd column, with what's produced in the last column, where #13 and 14 give specific examples that react amines functional groups with epoxy functional groups on the surface; col. 8, line 62-col. 9, line 14, esp. 3 and 10-11 with such suggested combinations; cols. 9-15+ with specific examples noting plasma may be pulsed (col. 9, line 50; col. 10 line 52; col. 12, line 56-57, etc); col. 16, line 30-60; & col. 20, line 18-col. 21, line 23 discussing and illustrating first plasma deposition using GMA, then plasma depositing an amine thereon via reaction with the epoxy group; and claims 1, 4-6, etc.

Applicants have previously objected to Kolluri et al. because the epoxy group is only one example of various functional groups that may be plasma deposited, however suggesting alternative functional groups in no way negates the teachings of the usefulness or the effectiveness of plasma and polymerization to achieve epoxy functionalized coatings. Additionally note, while Kolluri et al. do not explicitly teach that pulsed plasma is used with the deposition of GMA monomer, they do explicitly teach that the plasma depositions produce coatings that retain functional groups, which in the case of GMA is epoxy group (col. 16); they do generally teach that pulsed plasmas may be used; & explicitly state on col. 3, lines 9-25 that "pulsed plasma has been employed with variable duty cycle to preserve the functional groups of films during deposition using plasma polymerization... It is known that the power applied, the frequency of the pulse, and the duty cycle can be varied to preserve the functional nature of the deposited film...". Thus, while pulsed plasma may not be explicitly mentioned as used with the specific monomer GMA, the suggestions & advantages of employing pulsed plasma deposition in Kolluri et al. would clearly suggest to one of ordinary skill & competence in the art the advantages thereof, especially as combined with Timmons et al., who further elaborates on the advantages of pulsed plasma for functional group retention. Note that Kolluri et al. differs from the independent claims by not suggesting specific average power densities for their suggested pulsed plasmas, thus also for the specifically taught GMA

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monomer, but does like Timmons et al., they have teachings that suggest routine experimentation is expected for determining appropriate parameters for preservation of the functional nature of the deposited film, so these references are consistent with each other & continue to be considered as suggesting to one of ordinary skill in the art that the use of pulsed plasma, plus the choice of power density for preservation of a particular functional nature for a particular monomer would have been expected to be a matter of routine experimentation, lacking any clear evidence to the contrary.

9. **Claims 1, 12 & 21** are rejected under 35 U.S.C. **103(a)** as being unpatentable over **Timmons et al.** ((753), discussed above in section 6), in view of **Chabreck et al.** (WO 98/28026), previously discussed in section 9 of the action mailed 5/17/2007.

**Chabreck et al.** provide teachings concerning plasma polymerization mechanisms for unsaturated (i.e. vinyl groups, p.9) monomers carrying reactive groups, such as epoxies, where it is desired to retain the reactive groups or functionalities on the plasma polymerized coating, where the last paragraph on p.4 teaches that epoxy groups are particularly susceptible to plasma decomposition. Chabreck et al. teach that controlling & retaining the functional groups on deposits of the plasma polymerized unsaturated monomers with reactive groups, such as GMA (p.33, Ex.B-5), is effected by use of the afterglow of the plasma, which is mechanistically equivalent to the off-time in a pulsed plasma process. Additionally, when discussing useful plasma parameters, Chabreck et al. teach that the plasma is preferably "an inductively coupled, pulsed radio frequency glow discharge plasma" (page 11, especially last two lines). Chabreck et al. further teach that their primary plasma polymerized coatings with reactive groups, such as epoxies, may be further reacted, such as with solutions where the compositions have groups reacted with the retained reactive group of the polymerized coating. Examples C-14 & C-15 on page 38 employ the plasma polymerized coating of GMA to react with solutions of "4-amino-Tempo" or "Jaffamine ED2001", which appear to be tradenames for amine-containing compounds. In Chabreck et al., further see the abstract; 1st paragraph, p.1; p. 3-6, especially the paragraph bridging p. 5-6+

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following paragraph; page 7, 3rd full paragraph, noting suggested amine-containing molecules for the top or secondary coating, such as aminoalkanes like methylamine ; p.12, especially paragraph bridging p.12-13; paragraph bridging p. 16-17 through p. 19, especially top & middle paragraphs p.17).

Given the above teachings of Chabreck et al. on the need to protect functional groups like epoxies on monomers, such as GMA, from the decomposition effects of plasma in order to provide plasma polymerized epoxy functionalized coatings to be used for further reaction was secondary coatings that may contain amines, it would have been obvious to one of ordinary skill in the art to employ unsaturated epoxy containing monomers, such as GMA, in the pulsed plasma process of Timmons et al. as discussed above, as Chabreck et al. indicate that GMA requires protection from the decomposition effects of an *in situ* continuous plasma in order to provide plasma polymerized depositions that retained the epoxy functional group, while simultaneously indicating that pulsed plasmas that employ the afterglow from the plasma discharge will both enable such retention of epoxy functionalities in the deposited coating and effectively polymerized the GMA, hence the examiner takes notice that one of ordinary skill in the art would recognize the correspondence with the pulsed plasma teachings of Timmons et al., which recognize the superior retention of functional groups in general when using pulsed plasmas versus continuous plasmas, as well as the resultant coatings usefulness for reacting with secondary coatings, such as amines, and thus apply the above discussed teachings of routine experimentation in Timmons et al. to determine effective pulsed plasma parameters for GMA used in Timmons particular pulsed plasma polymerization deposition technique, as Chabreck et al. explicitly suggest that analogous treatment is necessary with GMA monomer is for functional group retention.

10. As previously cited, **art of interest** included: Kokaku et al. (4,863,557: col. 3, lines 3-16 & col. 4, lines 4-22; & 4,560,641; col. 3, lines 39-68, especially 63-67 & col. 6 examples 5 & 6), who teach GMA & AGE or glycidyl vinyl ether as used equivalently for plasma polymerization deposition; and Taguchi et al. (2003/0124382 A1), who in [0039] terms glycidyl acrylate, GMA & AGE, as all being

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classed as epoxy-containing vinyl monomers, thus all showing expectations of analogous chemistry &/or analogous plasma polymerization reactions. Note that Kokaku et al. (557), while not teaching the necessity of having remaining epoxy functionalities, nor pulsed plasma, does indicate that for their 13.56 MHz HF plasma at monomer pressures of 0.01-5 Torr, that appropriate ranges of plasma density (for area, not volume) include 0.01-10 W/cm<sup>2</sup>, which is not quite the same parameter as claimed, noting inclusion of a third dimension would likely produce overlapping parameter ranges. Similarly, Yokura et al. (JP 01-171856) performs plasma polymerization, particularly of acrylic or methacrylic compounds having a glycidyl group, where the English abstract particularly exemplifies glycidyl methacrylate preformed at pressure = 0.12 Torr & a power density discharge of 400 Wmin/m<sup>2</sup> (again based on area not volume), which is equivalent to 0.04 Wmin/cm<sup>2</sup>, thus it is noted that it is old and well-known in the art to employ relatively low power density is for plasma polymerization of GMA, even when there is no necessity in the teachings stating the desirability of maintaining the presence of the glycidyl (= epoxy groups) on the surface of the deposited layer, hence these references can be considered to provide evidence in support of or cumulative to the above discussed teachings of Timmons et al., as combined with the above rejections, as a person of ordinary skill in the art when employing the teachings of routine experimentation would have reasonably considered such known power densities as maximum starting points for routine experimentation for preserving epoxy groups on GMA, given teachings suggesting that retention of the epoxy groups require lower power. It would be a matter of competence for a person of ordinary skill to consider variation in plasma parameters of particular reagents based on known parameters for related plasma polymerizations in combination with Timmons teachings on how to preserve functional groups on plasma polymerized depositions.

Also, Hitachi LTD's JP 58-66938, as indicated by its 2007 Derwent abstract was found to be of interest for plasma polymerization of materials intended to be far-UV sensitive, where the abstract specifically indicates glycidyl methacrylate as being a useful material therefore, but the abstract contains



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no information on whether or not pulsed plasmas were contemplated, nor whether or not the plasma polymerized deposit contains reactive epoxy groups.

11. Applicants' arguments filed 6/30/2008 & partially discussed above have been fully considered but they are not persuasive.

Still lacking any clear evidence of unexpected results for the specifically claimed monomer GMA & the claimed range of average power densities, which both of which have been well discussed in the above rejections, the preponderance of the evidence is considered to continue to indicate that routine experimentation for optimization for the specific apparatus & material would have been expected to have been performed by one of ordinary skill in the art in order to achieve claimed results of the reactive epoxy functional groups being retained in polymerized deposits, as is indicated/suggested to be desirable by the prior art & achievable by pulsed plasma deposition with optimized parameters inclusive of power density. Limiting the plasma polymerization process to a specific monomer which has already been shown to be an obvious monomer for plasma polymerization for reasons as discussed above is not considered to overcome the above rejections, especially considering that the required plasma parameters have been broadened, with the claimed average power density range having no clear relationship with any of the examples.

With respect to applicants' arguments concerning Timmons et al. & Connell et al., it appears that applicants believe that each reference must be virtually a 102 in order to be combinable, however the demonstration of the equivalence of two epoxy compounds for plasma polymerization need not rely on both references having the same enduse, in order to provide a reasonable expectation that plasma deposition processes would have analogous results & that advantages of a particular variety of plasma processing, in this case pulsed plasma processing, which is taught to have an advantageous affect generically for functional groups on plasma polymerized monomers, would have reasonably been expected given the evidence of equivalent use in plasma polymerization depositions, to behave

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analogously. Applicants' apparent suggestion that in order to combine Connell et al. with Timmons et al., Timmons must disclose GMA (page 5 of 6/30/08 response), simply makes no sense, since there would be no reason to combine Connell et al. to supply a teaching Timmons et al. already had. Applicants appear to apply the same illogic to the rejections that combine Timmons et al. with Kolluri et al. or Chabreck et al. (page 8 of the 6/30/08 response). Applicants' discussion on pages 6-7 of their 6/30/2008 response continues to rely on unclaimed parameters & discussion that is not commensurate in scope with claimed requirements. The examiner finds that a particular calculation for average power as cited by applicants at the top of column 8 in Timmons et al., is no way inconsistent with the claim of average power density by applicants, since while not the same, average power & average power density are related, thus the teachings in no way negates the need or expected usefulness of routine experimentation for a particular monomer & apparatus. The examiner agrees with applicant's statement "...that straightforward extrapolation from the Timmons plasma polarization conditions to the presently claimed powers does not necessarily lead to unexpected results" (emphasis added, page 7 of 6/30/08 response), but cannot agree that no unexpected results demonstrate any novelty or unobviousness.

Applicants' arguments concerning deposition using GMA versus AGE, by which the examiner presumes they are referring to their specification's figures 2 & 8 from examples 1 & 4, respectively, as has been previously pointed out to applicants, does not provide data which is commensurate in scope with the claims, hence provides no clear evidence with respect to the patentability of claimed limitations. That 2 different epoxy monomers provide different IR spectra when treated in the like pulsed plasma peak power & on/off times (methodology of the example 1 said to be used in example 4, thus presumably like temperatures, pressures, frequencies etc. were used, although not restated), gives only a single data point, which as previously pointed out by the examiner cannot be clearly related to the claimed limitations due to the lack of correspondents between claimed power densities & information provided concerning the experimental parameters. Furthermore, as these two epoxy monomers have different overall chemical

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structure, one of ordinary skill & competence in the art would expect different optimization for their use in pulsed plasma deposition due to expected different activation energies, etc., required for reaction, when one wants as was shown to be known & desirable in the prior art, to retain the epoxy functional group, thus this single comparison under energy conditions that cannot be properly compared to those claimed, nor even if they were commensurate as a single data point could the single data point show relevance to the metes and bounds of the claimed parameter range.

Applicants' page 8 argument that a single exemplary use of pulsed plasma in step 2 of Ex. 1 at 100 W power & pulsed at 10 Hz with a 10% duty cycle (no plasma volume given, thus no power density can be necessarily determined, but it's a 4.0 liter plasma reaction chamber, so average power density could be about  $(100 \text{ W} \times .10)/4.0 \text{ L} = 0.0025 \text{ W/cm}^3$ ), somehow determines all pulsed power usage as taught by Kolluri et al. fails to provide any convincing arguments therefore (or why a single power usage, with power density unknown, should be considered a necessary difference from power density of the claims, particularly considering the 4.0 L plasma chamber), especially considering this example is for plasma polymerization of acrylic acid optimized to retain acid functional sites, where applicants have provided no rationale why one of ordinary skill in the art would necessarily apply an optimization for acrylic acid to the alternative options using epoxies (probably more reactive), such as examples using GMA as found on cols. 16 or 20, when col. 3 as previously pointed out, so clearly suggests optimization dependent on the nature of the functional group being deposited and maintained. It would be reasonable to consider the acrylic acid parameters as a starting point for routine experimentation, given both have oxygen functionalities & no other specific examples that are closer, however one would not consider simply the power applied without consideration of the volume over which it is applied, as has been done by in applicants' arguments.

Applicants' arguments with respect to Charbrecek et al., failed to address the reasons for obviousness presented by the examiner, as their arguments appear to equate a remote plasma as having

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the same effect as an *in situ* continuous plasma, which any one of ordinary skill in the art would not agree with, since no plasma is being actively produced at the deposition site, so that when depositing, the conditions are more analogous to the off-time during a pulsed plasma, than the on-time.

It is further noted that as applicant's arguments rephrase many previous arguments, statements made in section 8 of the action mailed 12/31/2007 remained relevant.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marianne L. Padgett whose telephone number is (571) 272-1425. The examiner can normally be reached on M-F from about 9:00 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marianne L. Padgett/  
Primary Examiner, Art Unit 1792

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